DO NOW

FILL IN THE GAPS

	x^n
$(x^2)''$	a.)
b.)	x^{-2}
$\sqrt{x}$	c.)
d.)	$x^{\frac{3}{2}}$
1	e.)
$x\sqrt{x}$	f.)

Revision Indices

$25^{\frac{3}{2}} = (\sqrt[2]{25})^3$

POWERS OF 2.

What do you notice about all of the numbers:

$2, 8, 4, 16, 32, 64$

$2^1, 2^3, 2^2, 2^4, 2^5, 2^6$

$3^0, 3^1, 3^2, 3^3, 3^4$

$1, 3, 9, 27, 81$

$5^0, 5^1, 5^2, 5^3$

$1, 5, 25, 125$

$x^a \times x^b = x^{a+b}$

$x^a \div x^b = x^{a-b}$

1 Solve $4^x = 2^{10}$

SAME BASE

$(2^2)^x = 2^{10}$

$2^{2x} = 2^{10}$

$2x = 10$

$x = 5$

2 Solve $2^x = \frac{8^3}{\sqrt{2}}$

$2^x = \frac{(2^3)^3}{2^{1/2}}$

$2^x = \frac{2^9}{2^{1/2}}$

$2^x = 2^{8.5}$

$x = 8.5$

3 If $2\sqrt{2} = 2^k$, determine k.

$2^1 \times 2^{1/2} = 2^k$

$2^{\frac{3}{2}} = 2^k$

$k = \frac{3}{2}$

1 If $9\sqrt{3} = 3^k$, find k.

$3^2 \times 3^{1/2} = 3^k$

$3^{5/2} = 3^k$

$k = \frac{5}{2}$

2 Solve $3^x = 9^{2x-1}$

$3^x = (3^2)^{(2x-1)}$

$3^x = 3^{4x-2}$

$x = 4x - 2$

$2 = 3x$

$x = 2/3$

Write $81 \times \frac{3^0}{27^2}$ as a power of 3.

$3^4 \times \frac{3^0}{(3^3)^2}$

$3^4 \times 3^{-6} = 3^{-2}$

Write $\frac{1}{125} \times 25^9$ as a power of 5.

$5^{-3} \times (5^2)^9$

$= 5^{-3} \times 5^{18}$

$= 5^{15}$

Write $\frac{\sqrt[3]{81}}{3}$ in the form 3^k, where k is a constant to be found.

$\frac{(3^4)^{1/3}}{3^1} = \frac{3^{4/3}}{3^1}$

$= 3^{1/3}$

Solve for the unknown value (1)

1. $8^2 = 2^{2m-4}$

$(2^3)^2 = 2^{2m-4}$

$2^6 = 2^{2m-4}$

$6 = 2m-4$

$m = 5$

2. $16^5 = 2^{2m+4}$

$2^{20} = 2^{2m+4}$

$2m+4 = 20$

$2m = 16$

$m = 8$

3. $27^4 = 3^{5m-3}$

$(3^3)^4 = 3^{5m-3}$

$3^{12} = 3^{5m-3}$

$5m-3 = 12$

$5m = 15$

$m = 3$

4. $81^5 = 3^{3m+2}$

$(3^4)^5 = 3^{3m+2}$

$3^{20} = 3^{3m+2}$

$20 = 3m+2$

$18 = 3m$

$m = 6$

5. $25^6 = 5^{7m-9}$

$(5^2)^6 = 5^{7m-9}$

$5^{12} = 5^{7m-9}$

$12 = 7m-9$

$21 = 7m$

$m = 3$

6. $125^7 = 5^{9m+3}$

$(5^3)^7 = 5^{9m+3}$

$5^{21} = 5^{9m+3}$

$21 = 9m+3$

$18 = 9m$

$m = 2$

Solve for the unknown value (1)

1. $128 = 4^{2x} \times 2^{x}$

$2 \times 64 = (2^2)^{2x} \times 2^{x}$

$2 \times 2^6 = 2^{4x + x}$

$2^7 = 2^{5x}$

$5x = 7$

$x = \frac{7}{5}$

2. $\frac{8}{2^7} = 2^n$

$\frac{2^3}{2^7} = 2^n$

$2^{-4} = 2^n$

$n = -4$

3. $4^5 \times 2^{-4} = 2^k$

$(2^2)^5 \times 2^{-4} = 2^k$

$2^6 = 2^k$

$k = 6$

4. $\frac{1}{\sqrt[3]{9^4}} = 3^n$

$\frac{1}{((3^2)^4)^{1/3}} = 3^n$

$3^{-8/3} = 3^n$

$n = -\frac{8}{3}$

5. $16^{\frac{1}{5}} \times 2^{x} = 8^{\frac{3}{4}}$

$(2^4)^{\frac{1}{5}} \times 2^{x} = (2^3)^{3/4}$

$2^{\frac{4}{5} + x} = 2^{9/4}$

$x + \frac{4}{5} = \frac{9}{4}$

$x = \frac{29}{20}$

6. $5 \times 4^{\frac{2}{3}} + 3 \times 16^{\frac{1}{3}} = 2^p$

$5 \times (2^2)^{\frac{2}{3}} + 3 \times (2^4)^{\frac{1}{3}} = 2^p$

$5 \times 2^{4/3} + 3 \times 2^{4/3} = 2^p$

$8 \times 2^{4/3} = 2^p$

$2^3 \times 2^{4/3} = 2^p$

$3 + \frac{4}{3} = p$

$\frac{13}{3} = p$

$5x + 3x$

$= 8x$

7. $5^n \times 5^{n+4} = 25$

$5^{2n+4} = 5^2$

$2n + 4 = 2$

$2n = -2$

$n = -1$

8. $2^{a^2} = 8^a \times 16$

$2^{a^2} = 2^{3a} \times 2^4$

$2^{a^2} = 2^{3a+4}$

$a^2 = 3a + 4$

$0 = a^2 - 3a - 4$

$0 = (a - 4)(a + 1)$

$a = 4$ $a = -1$

9. $9^{0.5p} \times 81 = 27^{2p-1}$

$(3^2)^{0.5p} \times 3^4 = (3^3)^{2p-1}$

$3^{p+4} = 3^{6p-3}$

$p + 4 = 6p - 3$

$7 = 5p$

$p = \frac{7}{5}$

Exam problem

21 Given that $M = \dfrac{18^{4n} \times 2^{3(n^2-6n)} \times 3^{2(1-4n)}}{12^2}$

find the values of n for which $M = 2$

$$2 = \frac{(3^2 \times 2)^{4n} \times 2^{3n^2-18n} \times 3^{2-8n}}{(3 \times 2^2)^2}$$

$$2 = \frac{3^{8n} \times 3^{2-8n} \times 2^{4n} \times 2^{3n^2-18n}}{3^2 \times 2^4}$$

$$2 = \frac{\cancel{3^2} \times 2^{3n^2-14n}}{\cancel{3^2} \times 2^4}$$

$$2^1 = 2^{3n^2-14n-4}$$

$$1 = 3n^2 - 14n - 4$$

$$0 = 3n^2 - 14n - 5$$

$$0 = (3n+1)(n-5)$$

$$n = 5 \qquad n = -\tfrac{1}{3}$$

1. Solve the following simultaneous equations without using a calculator.

$$4x - 3y = 11 \quad (1)$$

$$9^{y+3} = \frac{3\sqrt{3}}{27^x} \quad (2)$$

(2.)

$$(3^2)^{y+3} = \frac{3^{3/2}}{(3^3)^x}$$

$$3^{2y+6} = 3^{3/2 - 3x}$$

$$2y + 6 = \frac{3}{2} - 3x$$

$$4y + 12 = 3 - 6x$$

$$6x + 4y = -9 \quad (2)$$

$$4x - 3y = 11 \quad (1)$$

$$18x + 12y = -27$$

$$18x - 12y = 44$$

$$34x = 17$$

$$x = \frac{1}{2}$$

$$4\left(\frac{1}{2}\right) - 3y = 11 \quad (1)$$

$$3y = -9$$

$$y = -3$$

$$\left(\frac{1}{2}, -3\right)$$

2. Determine the value of k

$$\frac{2^{288} + 2^{285}}{9} = 2^k$$

$$\frac{2^{285}(2^3 + 1)}{9} = 2^k$$

$$\frac{2^{285} \times \cancel{9}}{\cancel{9}} = 2^k$$

$$2^{285} = 2^k$$

$$k = 285$$

3. Solve the following

$$6^{x+2} \times 2^{1-x} = \frac{8}{3}$$

$$(2 \times 3)^{x+2} \times 2^{1-x} = \frac{8}{3}$$

$$2^{x+2} \times 3^{x+2} \times 2^{1-x} = \frac{8}{3}$$

$$2^3 \times 3^{x+2} = \frac{8}{3}$$

$$8 \times 3^{x+2} = \frac{8}{3}$$

$$3^{x+2} = \frac{1}{3}$$

$$3^{x+2} = 3^{-1}$$

$$x+2 = -1$$

$$x = 1$$

4. Solve for x

$$\frac{1}{x} \times \sqrt{\frac{x\sqrt[2]{x^5}}{(\frac{1}{\sqrt{x}})^3}} + \frac{2}{\sqrt{x}} \times \left[2\sqrt{x^3} - (\frac{1}{\sqrt{x}})^{-3}\right] + x(x^3\sqrt{x})^{-\frac{2}{7}} = 4$$

$$x^{-1} \times \sqrt{\frac{x^{\frac{9}{2}}}{x^{-3/2}}} + 2x^{-\frac{1}{2}} \times \left[2x^{3/2} - x^{3/2}\right] + x(x^{7/2})^{-\frac{2}{7}} = 4$$

$$x^2 + 2x + x(x^{-1}) = 4$$

$$x^2 + 2x + 1 = 4$$

$$x^2 + 2x - 3 = 0$$

$$(x+3)(x-1) = 0$$

$\underline{x = 1}$ $\quad$ $x = -3$

IGNORE AS $\sqrt{-3}$ IS UNDEFINED.